A Primal-Dual Gradient Method for Time-Varying Optimization with Application to Power Systems

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ABSTRACT

We consider time-varying nonconvex optimization problems where the objective function and the feasible set vary over discrete time. This sequence of optimization problems induces a trajectory of Karush-Kuhn-Tucker (KKT) points. We present a class of regularized primal-dual gradient algorithms that track the KKT trajectory. These algorithms are feedback-based algorithms, where analytical models for system state or constraints are replaced with actual measurements. We present conditions for the proposed algorithms to achieve bounded tracking error when the cost and constraint functions are twice continuously differentiable. We discuss their practical implications and illustrate their applications in power systems through numerical simulations.

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